

Earth-Space Science

6–12

Section 08

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1 Knowledge of the nature of science

1. Analyze processes of scientific inquiry.
2. Evaluate models used in science to explain patterns observed in nature (e.g., rock cycle, heliocentric, geocentric, nitrogen cycle, water cycle).
3. Identify the influences of science and society on each other.
4. Analyze the synergistic relationships between basic and applied research, technology, the economy, and the public good.
5. Evaluate the appropriate use of inferences, assumptions, observations, hypotheses, conclusions, laws, and theories.
6. Analyze scientific data presented in tables, graphs, and diagrams.
7. Differentiate between qualitative and quantitative data in experimental, observational, and modeling methods of research.
8. Apply state statutes and national guidelines regarding laboratory safety, hazardous materials, experimentation, and the use of organisms in the classroom.
9. Differentiate between the various roles of communication in the development of scientific ideas (e.g., collaboration, peer review, scientific debate).
10. Distinguish between accuracy, precision, systematic error, and random error, using significant figures appropriately.
11. Evaluate variables and affected outcomes for appropriate experimental designs with minimum bias.
12. Identify the equipment Earth and space scientists use to gather, analyze, and interpret data in field and laboratory investigations.

2 Knowledge of the composition, characteristics, and structure of Earth

1. Identify the characteristics of Earth's layers and the methods used to investigate Earth's interior.
2. Identify common rocks and minerals based on their physical and chemical properties.
3. Distinguish between igneous, metamorphic, and sedimentary rocks.
4. Identify processes and products within the rock cycle.

3 Knowledge of plate tectonics and related processes

1. Identify the historical development and supporting evidence that has led to the theory of plate tectonics.
2. Analyze the geologic processes involved in the movement of tectonic plates and the landforms produced by their movements.
3. Differentiate between the physical and chemical characteristics of oceanic crust and continental crust.
4. Identify the types, causes, and effects of volcanoes.
5. Identify the causes and effects of earthquakes.
6. Distinguish between the characteristics of seismic waves.
7. Identify how the movement of tectonic plates has influenced climate (e.g., hydrosphere, geosphere, biosphere).

4 Knowledge of Earth's surface processes

1. Compare physical and chemical weathering and their effects on landforms.
2. Analyze the principles and processes of sedimentation (i.e., erosion, deposition).
3. Identify the properties of aquifers and the movement of groundwater through sediments and rock formations.
4. Analyze the movement of water through the hydrologic cycle, including energy changes that occur as water changes phase.
5. Evaluate the origin and distribution of freshwater resources in Florida.
6. Discriminate between landforms and sedimentary deposits created by water, wind, and ice.
7. Identify the geologic features of Florida and the processes that produced them.

5 Knowledge of mapping and remote sensing

1. Identify surface features from topographic maps, photographs, and satellite images.
2. Interpret topographic and oceanographic maps.
3. Compare landforms illustrated on maps and imagery to geologic processes.

4. Evaluate the function and benefits of Earth-observing systems (e.g., Landsat, Topex, aircraft, balloons).
5. Identify the applications of remote sensing technologies used on Earth and in space science (e.g., magnetometry, seismic survey, ground-penetrating radar, high-resolution photography).

6 Knowledge of the scope and measurement of geologic time

1. Identify appropriate methods of absolute and relative dating for given situations.
2. Apply the law of original horizontality, the principle of superposition, and the principle of cross-cutting relationships to interpret geologic cross sections.
3. Identify major events in Earth's history (e.g., mass extinctions, evolution of plants, development of an oxygen-rich atmosphere).
4. Identify major events in Florida's geologic history, including sea-level changes.
5. Interpret fossils and geologic evidence to reconstruct Earth's history.

7 Knowledge of the characteristics and management of Earth's resources

1. Identify characteristics of renewable and nonrenewable resources.
2. Evaluate management strategies for renewable and nonrenewable resources.
3. Assess the use and management of Florida's geologic, marine, and environmental resources.
4. Compare various energy production technologies (e.g., fossil fuels, nuclear, solar) and their past, present, and future consequences to the environment.
5. Identify the impact of humans on Earth (e.g., deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water).

8 Knowledge of oceans and coastal processes

1. Identify the characteristics of ocean basins, continental shelves, and coral reefs.
2. Identify the geologic features of coastal geomorphic structures (e.g., barrier islands, estuaries, sandbars, capes, deltas, coral reefs).
3. Analyze the movement of water through waves, tides, and currents.
4. Identify the chemical, physical, and biological characteristics of seawater.

5. Determine the causes and effects of surface currents, coastal upwelling, and density-driven (i.e., thermohaline) circulation.
6. Identify the effects of human activity on the coastal and marine environment.

9 Knowledge of factors that influence atmospheric conditions and weather

1. Analyze the composition and structure of the atmosphere and how it protects life and insulates the planet.
2. Differentiate between the sources, characteristics, and movement of air masses (e.g., maritime, continental, polar, tropical).
3. Identify characteristics of high and low pressure systems, including the formation of fronts and severe weather systems.
4. Identify factors that cause local winds (i.e., land and sea breezes) and global winds (e.g., pressure belts, Coriolis effect).
5. Determine how the transfer of energy throughout the atmosphere influences weather conditions (e.g., hydrologic cycle).
6. Interpret weather maps and the indicated atmospheric conditions.
7. Evaluate how local weather is affected by geographic features (e.g., proximity to bodies of water, urban versus rural settings, unequal heating of land and water).
8. Identify characteristics of weather systems that affect Florida.
9. Identify how global climate influences, such as jet streams and ocean currents, affect weather (e.g., El Niño).

10 Knowledge of Earth's climate patterns

1. Identify the factors that contribute to the climate of a geographic area.
2. Identify the causes and effects of climate changes throughout Earth's history.
3. Assess how the cycling of carbon, energy, and water between the geosphere, hydrosphere, and atmosphere affects climate.
4. Determine the effects of climate phenomena (e.g., monsoons, jet streams, El Niño).
5. Identify how climate changes may affect Florida's surface features, weather patterns, and biological diversity.

11 Knowledge of astronomical objects and processes

1. Identify the characteristics (e.g., mass, composition, location) of the major and minor objects in the solar system.
2. Identify types and characteristics of deep space objects (e.g., quasars, galaxies, pulsars, black holes).
3. Interpret the Hertzsprung-Russell diagram with regard to stellar evolution and star characteristics.
4. Interpret the sequences and forces involved in the origin and evolution of the solar system.
5. Identify the causes and effects of the cycles of the Earth-Moon-Sun system (e.g., seasons, tides, eclipses, precession, moon phases).
6. Identify the physical properties of the Sun, its dynamic nature, and its effects on Earth systems.
7. Identify the matter and forces involved in the evolution of the universe (e.g., big bang theory).

12 Knowledge of space exploration

1. Compare relative and absolute methods for measurement of astronomical distances.
2. Evaluate functions and benefits of the different types of ground- and space-based astronomical instruments (e.g., x-ray, optical, infrared, radio telescopes, spectrometers).
3. Interpret electromagnetic spectra and radiation intensity data from astronomical objects.
4. Identify significant manned and unmanned space exploration events, programs, and objectives.
5. Identify the historical development of astronomy based on the contributions of Aristotle, Ptolemy, Copernicus, Brahe, Kepler, Galileo, Newton, Einstein, and Hubble.
6. Evaluate the cultural and economic effects of the space program in Florida.